

Energy: The North American Advantage

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The word “energy” has vanished from the vocabulary of those making short and long-term economic projections. Yes, forecasters will genuflect slightly to oil when they lay out their scenarios. And yes, those looking to the long term will acknowledge that supply availability will be critical far down the road. Very few, however, give the subject much more than a passing thought.

Even Shell’s vaunted scenario planners, who enjoy accolades from the world’s intelligentsia despite a terrible track record, pay little heed to energy. Instead, the key forecasting issues today are climate change, labor force skills, and, of course, government debt. The debt is particularly important. Again and again, one hears that the United States’ economy requires urgent action to reduce the nation’s financial liability.

Today the concern regarding the energy question is minimal. Yet energy prices and the institutional characteristics of the industry will play an enormous role in determining relative growth rates between regions. As this paper explains, these factors will propel growth in North America and the United States in particular well above expected rates, while growth rates in Europe, Asia, and Latin America fail to meet projections. There are several reasons for this expectation.

First, North America, led by the United States, will enjoy very low energy prices relative to the rest of the world for ten years or more. The low energy prices will fuel economic growth in numerous sectors. As shown here, the effects of this competitive advantage are just beginning to appear.

Second, the United States' financial system is vastly superior today to systems in Europe and Asia. Following the 2008 crisis, the US corrected the issue of bad bank loans. European regulators are just beginning to confront the same problem. Similar troubles in China are starting to emerge. As a result, credit will be more available to modest-sized organizations here than in other parts of the world.

Third, the United States is unique in not being at the mercy of large integrated companies. In numerous areas of the economy—information processing and energy, for example—small independent firms have developed inexpensive solutions to complex problems, driving down costs and prices. In many cases, these companies have experienced extraordinary success. Innovation in the US financial sector has helped in this regard, fueling large changes in the energy sector.

Fourth, the United States and Canada are benefiting from having been energy gluttons in the past. Circumstances today make it possible for these countries to achieve substantial savings from energy conservation at a relatively low cost.

Fifth, the United States and Canada benefit from the majority of interactions between government and citizens occurring at the local, state, or provincial level rather than the federal level. Thus few national directives come down from Ottawa or Washington regarding economic management or economic activity. The reverse is true in the European Union and China, although it is not clear whether Beijing's influence is as strong as some think.

Finally, North American energy users are not at Russia's mercy. That country's natural gas pricing policies and its efforts to keep oil prices high may pose the greatest threat to the

economic health of anyone who relies on it for energy supplies. The actions taken toward nations Russia describes as “near abroad” may indicate the country’s future policies. Indeed, Russia may provide the greatest impetus of all for the American Decade and perhaps the American Half-Century.

This paper traces the unforeseen benefits that will accrue to the United States and to a lesser extent Canada and Mexico from these unexpected developments. It begins, however, by laying the background.

Background

The United States’ economic outlook is positively dismal according to many. The leading pessimist may be Harvard professor Niall Ferguson. Ferguson published *The Great Degeneration* last summer.¹ In the book’s concluding section, he argues against “techno-optimism,” noting that “the lesson of history that a country that achieves technological innovation and profitable geopolitical expansion can grow its way out from under a mountain of debt” does not apply to the US.² He thinks this country’s debt relative to GDP is too high. He doubts that technological breakthroughs will give us a “Get Out of Jail Free” card. In his view,

the harsh reality is that, from the vantage point of 2012, the next twenty-five years (2013-38) are highly unlikely to see more dramatic changes than science and technology produced in the last twenty five (1987-2012.)

He goes on to predict the onset of violence and instability in America.³

¹ See *The Great Degeneration: How Institutions Decay and Economies Die* (New York: Penguin, 2012).

² Ferguson, p. 147.

³ Ferguson, p. 149.

Many others concur with Ferguson's bleak vision. *Financial Times* correspondent Edward Luce, for example, is equally pessimistic. In his 2012 book *Time to Start Thinking*, Luce writes of "America in the age of descent" and the collapse of America's middle class.⁴ He cites statistics that show the United States falling behind other leading countries by almost every measure. America's infant mortality rate, for instance, is greater than in Scandinavia, Germany, or Japan.⁵ Americans are also more prone to be obese than Europeans. Luce also notes, correctly, that more Americans are likely to be in prison than in any other country.⁶ He wonders, as Ferguson does, how long these things can go on before something breaks.

Canadian author Jeff Rubin is a member of this doom-and-gloom camp as well. In *The Big Flat Line*, the former CIBC economist lays out a grim forecast for the United States. His subtitle for the work, "Oil and the No-growth Economy," explains his thinking. Rubin argues that high oil prices and the US failure to embrace conservation and fuel substitution will constrain future growth.⁷

Gordon has similar misgivings about the United States' future. In 2012, he offered six reasons for the end of US growth: declining innovation, falling educational attainment, rising income inequality, globalization, energy, and growing deficits. In his view, these factors could cut US per-capita growth from 1.8 percent per year to as low as 0.2 percent annually by the end of the century.⁸

Low Energy Prices: the Key to North American and US Economic Success

In January 1983, *The Economist* published an issue on the impact of energy prices. The cover shows the cartoon character Popeye chugging a barrel of oil rather than the usual can of spinach along with the

⁴ See Edward Luce, *Time to Start Thinking: America in the Age of Descent* (New York: Atlantic Monthly Press, 2012).

⁵ Luce fails to note that far more American babies survive premature birth due to the great capabilities of modern US hospitals.

⁶ Luce, p. 280.

⁷ See Jeff Rubin, *The Big Flatline: Oil and the No-Growth Economy* (New York: Palgrave Macmillan, 2012).

⁸ See Richard J. Gordon, "Is US Economic Growth Over? Faltering Innovation Confronts Six Headwinds," CEPR Policy Insight No. 63, September 11, 2012.

headline “Cheaper oil makes ya strong.” The image and words capture everything there is to say about the link between energy prices and economic growth. When the publication came out, the editors imagined that lower oil prices would stimulate the global economy. Many writers at the time echoed this thinking. The hope was that oil and natural gas prices would fall across the world. In 2013, the prospect has come true but for only North America.

The United States, Canada, and to a lesser extent Mexico are benefiting today from cheap oil and natural gas. The low fuel prices work to the advantage of US manufacturers, particularly those who make chemicals and petroleum products. Eni’s CEO Paolo Scaroni describes the situation here compared to Europe:

Europe is now in an uncomfortable position compared with a hyper-competitive US. And the problem will not disappear on its own. Even if the US were to export significant quantities of shale gas to the continent, by the time it has been liquefied, transported and regasified, it will be twice as expensive as it would be in the US. It is not enough to bring European gas prices down from today’s levels of about \$11-\$12 per mmBtu to, say, \$8-\$9. We need to go all the way to matching US benchmark gas prices of about \$3.50 per mmBtu.⁹

The US has reaped benefits from the efforts of its independent “explorationists.” These firms have found ways to extract natural gas and oil from shale in volumes previously thought impossible. Their success continues, much to the surprise of many.

As Figure 1 shows, output from US oil and natural gas wells has surged. The substantial rise in natural gas production created a significant surplus, which caused US prices to diverge from gas prices abroad and from crude oil. Figure 2 compares the US natural gas price with prices prevailing in Japan and Germany. Figure 3 looks at the US wellhead natural gas price, measured in dollars per barrel, in relation

⁹ Paolo Scaroni, “Russia and Shale Can Solve Europe’s Energy Problem,” *Financial Times*, October 31, 2013.

to Brent crude oil prices. The astonishing divergences shown in these graphs began in 2009 and have persisted since then.

Many experts are skeptical of the US competitive edge from low energy prices. They assert that depletion rates on wells producing shale gas are high and this requires drilling many wells every year to sustain output. When natural gas prices plunged, they expected productivity to drop. The evidence to date says otherwise.

The Energy Information Administration offers the same outlook, seeing production rising rapidly toward 2016 and then falling while drilling costs rise. International Monetary Fund economists expect production to decrease after 2020.¹⁰ These projections will likely prove wrong, just as the forecasts made in 2006 for 2020 US oil production have proven incorrect. The latter anticipated US output decreasing to 5.56 million barrels per day. Current forecasts, however, put 2020 production at 7.46 million barrels per day.

The ongoing achievements of oil and gas explorationists have begun to change expectations. The divergence in US oil and gas prices once seen as transitory is now viewed as permanent. As a result, firms across the globe are starting to alter their opinion of the longevity of the US low-cost energy advantage. Eni's CEO certainly seems to have recognized the true circumstances.

Scaroni is not the only executive who worries that Europe's high energy prices will slow growth. Last spring, *Financial Times* examined the problems confronting manufacturers there. The authors describe an "invisible mechanical vice" squeezing European companies. They also observe that higher and higher energy prices have frustrated attempts by EU governments to help "reindustrialize" Europe and raise the share of manufacturing from fifteen to twenty percent of GDP. As the authors note,

¹⁰ IMF, *Commodity Market Review*, October 2013, p. 11.

Gas prices in the US have fallen to about a quarter of the level in Europe, while electricity prices were last year about twice as high as in the US. At the same time, Germany is spearheading a costly switch from fossil fuels and nuclear energy to renewables.¹¹

The CEO of German utility EON, Johannes Teyssen, has been particularly outspoken on the issue. As *Financial Times* reports, Teyssen

...has warned it will be years before Europe can hope to counter the US's growing advantage in energy costs and predicts that the disparity will meanwhile lead heavy industry to abandon the continent.

He also told *FT* that

...there were no obvious options for Europe to narrow the US advantage—whether by drilling for shale gas, importing more liquefied natural gas, or importing inexpensive US supplies.¹²

The problems in Germany are particularly acute because the country has committed to increase the electricity produced from renewable sources from twenty-three percent in 2012 to thirty-five percent by 2020 and eighty percent by 2050. This transformation is being funded by a tax on most utility bills. The tax revenue totaled €14 billion in 2012 and will be €20 billion in 2013. Individuals and Germany's *Mittelstand* firms (the key small and mid-size businesses) pay the tax, along with many but not all large corporations.

German energy costs are boosted further by the country's feed-in tariffs. Farmers and even some towns have constructed renewable energy facilities that generate electricity from biomass, wind, and the sun.

¹¹ Chris Bryant and Richard Milne, "Europe's Manufacturers Caught in a Vise," *Financial Times*, May 26, 2013.

¹² Joshua Chaffin, "Eon Chief Warns US Energy Advantage Makes Europe Uncompetitive," *Financial Times*, September 29, 2013.

The surplus power is “fed into” Germany’s electricity grid. The suppliers receive government subsidies paid for by consumers. This support may total €1 trillion within twenty years.¹³

Asia faces the same problems as Europe in this respect. This was highlighted recently by Keisuke Sadamori, the IEA’s Director of Energy Markets and Security. He was previously Deputy Director of Policy Coordination at Japan’s Ministry of Economy, Trade, and Industry. Like all appointees to agencies like the IEA, he looks out first for his country’s interests. Speaking to an audience in Singapore, Sadamori offered this warning:

One notable and worrying development about this Asian LNG trade is the increased price disparity among the regions of the world. Natural gas has never had a global market. Nevertheless, in the past decade a convergence took place, and by 2009 there seemed to have been something like a global price of gas, between Asia, Europe and North America with less than a 10% difference from each other. Then, the last 3 years witnessed an amazing disconnect. The shale revolution crashed North American gas prices at exactly the same time as persistent oil indexation drove them to a record level in Asia. This is a massive competitiveness burden on Asian economies and will jeopardize the potential energy security and sustainability contribution of gas.¹⁴

As *The Economist* pointed out in 1983, “cheaper oil makes ya strong.” At present, the United States is gaining strength as others weaken. This can be seen in Consensus Economics’ projections for manufacturing production. Figure 4 presents these forecasts for the United States, France, Italy, Japan, and the United Kingdom. According to economists surveyed, only Germany will be able to keep pace with the United States. As shown above, though, executives at many German firms remain skeptical.

¹³ Chris Bryant, “Germany’s Renewable Energy Experiment Comes at a Cost,” *Financial Times*, September 15, 2013.

¹⁴ James Bourne, “Global Gas Price Disconnect a ‘Burden’ on Asian Economy: IEA Official,” *Platts Global Alert*, October 30, 2013.

The United States' good luck regarding energy prices will address part of the economic issue identified by Gordon. He argued that higher energy prices would subtract 0.2 to 0.4 percentage points per year from US growth over coming decades. These negative numbers will be erased by our low-cost energy. Indeed, they may even become positive and additive as economic activity moves to the US to take advantage of the low price environment.

Superiority of the US Financial Sector

The United States also benefits from a financial system superior to those in Europe, China, Asia, and other parts of the world. This advantage has several components, some permanent and some transitory.

The United States has gained from the seemingly perpetual superiority of its futures markets and the financial sector's ability to innovate. Both factors have been especially important for the energy industry. Specifically, the introduction of energy futures contracts for crude petroleum, petroleum products, natural gas, and electricity after 1980 has allowed smaller firms to overcome the very large capital requirements associated with energy products. In particular, the success of smaller exploration firms in rapidly developing shale gas and oil stems directly from the existence of futures markets and financial innovation.

These developments should not be all that surprising. Academic market experts began predicting the substantial impact of viable cash and futures markets on economy-wide competition many years ago. In his 1937 paper "The Nature of the Firm," Ronald Coase notes that, in the absence of well-functioning markets, firms integrate upstream into resource development and downstream into marketing because

these actions give them better price information. Having that information, in turn, helps them boost profits.¹⁵

Following Coase, Stephen Turnovsky, Holbrook Working, and Roger Gray¹⁶ all showed that the creation of large-scale futures markets (and the associated well-functioning cash markets) eliminated the advantages of vertical integration. A paragraph from Working's 1963 paper applies directly to the current situation:

When large merchandising or processing firms set out to free themselves from the need that a futures market imposes on them to compete with others on approximately equal terms in their buying or selling, they seek first to persuade smaller merchandising and processing firms, and producers, that they also are being harmed by the futures market. In this effort they are aided on the one hand, by the fact that most futures markets are open to some valid criticism and on the other, by the widespread tendency of most people to believe that speculation on futures markets does tend to generate unwanted price fluctuations, such as would not occur otherwise.¹⁷

The US energy industry's record supports the assertion that well-functioning markets are an anathema to integrated companies. As liquidity in energy commodity markets increased, the large integrated companies began to withdraw from the United States. This trend has continued in the current decade as ConocoPhillips and Marathon have divested refining and marketing activities. Surprisingly, few in the oil industry have tried to halt trading in energy futures. Instead, the large companies have retreated from the domestic arena, leaving it to a large group of smaller, more aggressive, more competitive firms.

¹⁵ See R.H. Coase, "The Nature of the Firm," *Economica* 4, No. 16 (November 1937), pp. 386-405.

¹⁶ See Stephen J. Turnovsky, "The Determination of Spot and Futures Prices with Storable Commodities," *Econometrica* 51, No. 5, (September 1983), pp. 1363-1387; Holbrook Working, "Futures Markets Under Renewed Attack," *Food Research Institute Studies* 4, No. 1 (1963), pp. 13-24; and Roger W. Gray, "Risk Management in Commodity and Financial Markets," *American Journal of Agricultural Economics* 58, No. 2 (May 1976), pp. 280-285.

¹⁷ Working, pp. 21-22.

The development of a liquid futures market in energy has also empowered explorationists. Analysts have repeatedly predicted that low US natural gas prices will curtail exploration and production projects. They have been wrong. Domestic gas output has continued to rise. Furthermore, greater per-well productivity has offset a decline in the number of wells drilled. The independent exploration firms now moving ahead have benefited from the upward-sloping forward price curve for natural gas, shown in Figure 5. While cash prices hover around \$3.60 per million Btu (mmBtu) at the Henry Hub (and a dollar less at the delivery point for the Marcellus Shale in Pennsylvania), forward prices trade at higher levels.

Forward prices have declined, however, as the fracking revolution's dimensions have become better understood. The price for gas to be delivered in January 2020 was \$6.38 per mmBtu in November 2011. In November 2013, it is \$4.37 per mmBtu, a thirty-eight percent decrease. (Figure 6 compares the two price curves.) Even so, producers are still taking advantage of US financial innovation, hedging seven trillion cubic feet of natural gas according to the US Commodity Futures Trading Commission. These hedges (the short positions of merchants in the detailed CFTC data¹⁸) account for twenty-seven percent of annual US natural gas production. As Figure 7 shows, the short position of merchant traders has risen sharply since January 2011.

The benefit of this inventive hedging, which allows producers to maintain operations when spot prices fall, has not been welcomed by all in the energy industry. Executives at some of the larger integrated oil and gas companies most likely regret the development. These individuals have kept silent on the topic, however. On the other hand, executives at Gazprom, the Russian gas monopoly, have been vocal about it. Sergei Komlev, Head of Contract Structuring and Price Formation at Russia's Gazprom Export, has explicitly attacked futures markets. Noting the wide difference between US and Russian prices, he wrote the following in January 2013:

¹⁸ Merchants are presumably producers or holders of inventories.

Hedging is another factor that causes a deferred producer response to over-production. However, this price-depressing factor is of a transitory nature. Mature futures markets enable producers to lock in profits for years ahead. But this results in limited supply flexibility in response to price changes when the forward curve is favorable to producers (contango). Even in the event that the realized price turns out to be lower than the expected price, a properly hedged producer should have nothing to lose. For example, while cash prices remain depressed in the U.S. (and indeed, are not even sufficient to cover the costs of gas production), this has not discouraged companies from producing despite the fact that they are selling their product at a much lower price than what they would have earned five years earlier. This demonstrates the dysfunctional role that hedging plays in influencing underlying supply trends; such mechanisms simply do not function properly in natural gas markets but rather have a lasting delay.¹⁹

Komlev views US markets as “dysfunctional” as well. A cynic might suggest the translator took the Russian word for “competitive” to mean “dysfunctional.” In reality, though, the Russians do not understand—or possibly resent—the informational role played by competitive markets, particularly the US natural gas market.

It is not just Russians who fail to comprehend futures markets. In 2012, Exxon CEO Rex Tillerson spoke of the prevailing low natural gas prices and asserted that every producer was losing money. In his talk, he showed no grasp of how futures markets work and no inkling that smart independent producers may be profiting through hedging.²⁰

The US crude oil market is benefiting from the same innovative forces. Crude oil producers have now sold more than half a billion barrels forward on the CME and ICE exchanges, a number equal to 1.5 million barrels per day of output.

¹⁹ Sergei Komlev, “Pricing the ‘Invisible’ Commodity,” Gazprom Export Discussion Paper, January 11, 2013, pp. 10-11.

²⁰ See Rex W. Tillerson, “The New North American Energy Paradigm: Reshaping the Future,” Council on Foreign Relations, June 27, 2012.

It is this competitive market and the benefits derived from it, combined with the open financial markets, that make the projections of future volumes of North American oil and gas production produced by organizations such as the IMF, the International Energy Agency, and the US EIA no better than **RANDOM NUMBERS**. These organizations did not recognize the growth of the competitive infrastructure in North America, do not understand the role of entrepreneurs in energy, and cannot comprehend the structural difference between operations in North America compared to other parts of the world. Like Exxon's Tillerson, they also do not recognize the enormous benefits hedging have conferred on these companies. They failed to anticipate the impact of shale because they did not see the structural change. Their current forecasts will almost certainly be well off the mark for the same reason.

No other country has matched the US success in developing energy commodity markets. The markets in Japan and China are small and cannot accommodate the attempts of smaller upstart firms to undermine the integrated companies operating there. The United Kingdom, in contrast, does have a successful futures contract: ICE Brent. This contract is permitting some smaller firms to take over the operation of North Sea properties originally developed by larger integrated companies such as BP and Shell. The effort of the smaller firms may in time provide the UK with economic benefits similar to those enjoyed by the US.

With the exception of the United Kingdom, other nations do not just lag the US in developing energy commodity markets, they have not even entered the race. Consequently, the outlook for growth in much of the world looks grim.

The US financial system's solvency is a second clear advantage the United States enjoys today. While possibly transitory, this condition will yield additional rewards at least through the end of the decade.

The United States' positive financial circumstances have resulted from the US Treasury and Federal Reserve's aggressive moves to repair financial institution balance sheets following the 2008 collapse. In particular, the Troubled Asset Relief Program (TARP) introduced in the midst of the crisis reestablished the foundation for markets.

Blinder describes the program as follows: "The TARP may be among the most successful—but least understood—economic policy innovations in our nation's history."²¹ Under the program, Congress granted the US Treasury \$700 billion to buy troubled assets or take other steps to shore up the economy. The Treasury decided to inject \$250 billion directly into a group of banks under a capital purchase program. These institutions were forced to take the cash. At the same time, the government limited their ability to pay large bonuses or dividends.²² The program worked even though it was opposed by the public and the banks.

Other government steps such as the quick bailout of AIG and the closing of failing banks such as Washington Mutual and Merrill Lynch quickly cleared out nonperforming assets and financially weak institutions. The Federal Reserve's quantitative easing program further relieved pressure on banks. Thanks in large part to these interventions, our financial sector is now in relatively good condition. The health of the banks allows them to provide loans to firms to explore for oil and gas as well as to construct the necessary infrastructure.

The Absence of Large Multinational Oil Companies

Americans also benefit because they are not at the mercy of large multinational firms. While many of these are a substantial presence here, they do not control policy or the economy's direction. Their lack

²¹ Alan S. Blinder, *After the Music Stopped* (New York: Penguin Press HC, 2013), p. 178.

²² Blinder, pp. 200-204.

of influence and relatively insignificant roles are particularly noticeable regarding oil companies. In the United States, these firms are simply one of many participants.

The United States freed itself from the energy behemoths' influence in the last two decades of the twentieth century. In those twenty years, the large companies entered into mergers that reduced their number from twelve to five. In 1980, the twelve giant integrated firms were Amoco, Arco, British Petroleum, Chevron, Exxon, Fina, Gulf, Mobil, Shell, Texaco, Total, and Unocal. One by one the smaller multinationals were absorbed. Today only BP, Chevron, ExxonMobil, Shell, and Total remain standing. The mergers were justified as the multinationals needed larger and larger mass to fund exploration in increasingly difficult environments. These deals were only permitted by regulators, however, if the joining firms sold off their refining assets. The "divorces" created refining companies that have become aggressive players in the domestic crude market, forcing sellers to take larger and large discounts.

The success of independent explorationists in expanding tight oil and gas production has made the large multinational oil companies more irrelevant, perhaps even unnecessary. When they merged, these firms thought such scale would be necessary to expand reserves. The development of shale proved the assumption wrong.

As Coase writes in his extraordinarily influential paper "The Nature of the Firm," companies integrate up to the point where it becomes less costly to hire outsiders. Over the past decade, oil exploration and production services have become less and less expensive in the United States. Firms seeking to develop reserves in North Dakota can, if they own or lease the land, hire others to bring the oil into production. Often such outsiders—Schlumberger for instance—do a better job for less money. Thus integration has no value in the United States. Here it may even be a curse.

The expansion of oil commodity markets has also made integration excessively expensive in the US. Firms like Marathon Petroleum and ConocoPhillips realized no benefits from owning refining and retailing assets. The Coaseian advantages of integration were destroyed by the growth of the NYMEX. As noted, these two companies have now sold off their refining and marketing arms.

In contrast, Shell Oil has stuck with the integrated approach and, in doing so, become the poster child for its futility. The firm spent billions acquiring access to shale acreage. Recently, though, it abandoned development efforts and wrote off \$4 billion. This outcome was predictable. The company brought nothing to the table but bureaucracy. Its costs were higher than its competitors and its expertise no better. Shell lost.

The ability of small firms to enter oil and gas exploration easily, as well as sectors such as computer hardware, software, or telephony, distinguishes the United States (and Canada) from almost every other country in the world. This difference gives the US an enormous advantage, particularly during times of rapid technological change.

The Benefit of Being an Ex-Energy Glutton

The United States, Canada, and Mexico will also reap rewards over the next ten years from their past gluttony. For decades, the United States has been widely criticized across the world for its avaricious energy consumption. Time and again, US officials have been lectured by counterparts from Asian nations for excessive energy use, and Europeans have long demanded that the US increase gasoline taxes to encourage conservation.

Neither the United States nor Canada took such steps. Still, both have gradually cut energy consumption. In doing so, they have realized the economic benefits associated with reduced energy expenditures. These savings have come from making relatively modest changes such as producing

vehicles with better fuel efficiency. Some would say the two countries have been picking “low hanging fruit” in this regard.

The relative improvement in US energy consumption and spending can be seen by comparing US energy expenditures with those of Sweden and Japan. The latter countries are recognized for their conservation efforts. The United States is not. Yet as Table 1 shows, the gain in US energy intensity, measured as Btu per 2005 dollar of GDP, has matched Sweden’s and been far greater than that of Japan. US energy intensity declined forty-five percent between 1980 and 2011 as Sweden’s decreased forty-seven percent and Japan’s only twenty-eight percent.

Figure 8 also illustrates the US gain in efficiency. This graph tracks the energy/GDP index for Germany, Japan, and the United States. EIA has published data for the US covering the forty-year period since the 1973 oil embargo. The agency has also issued similar information for almost all countries beginning in 1980, setting the 100 point for the indices at 1991.²³

As the table and graph help show, US energy intensity has been decreasing at an increasing rate. Much of this gain has resulted from natural gas substitution and improved US vehicle fuel economy. Both of those factors have received an enormous boost from the Federal Reserve’s quantitative easing (QE) program. The low interest rates sustained by QE have reduced the cost of replacing coal with natural gas in power generation. The low rates and the availability of financing have also enabled smaller businesses to convert their gasoline-powered trucks and vans to natural gas.

The greatest contribution of QE to our improving energy efficiency, though, relates to gasoline and diesel use. Because of QE, consumers have been able to replace older inefficient vehicles with new, vastly more efficient ones. This change reduced petroleum use by two million barrels per day in 2012

²³ EIA selected 1991 because data for a unified Germany were first published that year.

from projected levels.²⁴ In addition, consumers now save \$750 to \$1,000 per year by paying low interest on auto loans rather than high interest on credit card gasoline and diesel purchases.

The economic impact of the change appears in the detailed data published by the US Bureau of Economic Analysis (BEA). These data show the amounts spent in constant dollars on fuels by consumers. Comparing the amount spent on gasoline with the amount spent on all other items reveals a clear break in the historical relationship, as Figure 9 illustrates. This graph plots US gasoline expenditures on the vertical axis and expenditures on all other items on the horizontal axis. The historical trend, measured from 1999 to 2005, has clearly been broken. The data points below the trend line all occurred after 2007.

So the improvement (decrease) in US energy intensity noted above has had very positive effects. As Figure 8 illustrates, this intensity declined thirty-three percent from 1973 to 1991 and then fell again by one-third from 1991 to 2011. In comparison, Japan's energy intensity tracked the US improvement from 1980 to 1991 but after 1991 the gains in Japan ended.

There may be a lesson in the Japanese data. Energy efficiency improvements essentially stopped when the Japanese economy stopped growing. The decline corresponds to Japan's "lost decade." Figure 10 captures the country's experience. It shows the year-to-year percentage change in Japanese real GDP from 1975 to 2012, shading the 1991-2000 "lost decade." Averages tell the story. From 1974 to 1990, Japan's economy grew at an average rate of 4.6 percent per year. The country recovered from the 1973 oil shock and then expanded rapidly as exports pushed growth.

²⁴ EIA's 2005 projection of 2012 gasoline use was 10.7 million barrels per day. Actual use in 2012 was 8.5 million barrels per day, including ethanol. This indicates a reduction in gasoline use of almost three million barrels per day. By the estimates done here, two million barrels per day of this decrease resulted from greater efficiency.

Many believe Europe might be facing a “lost decade” of its own. The IMF warns of a global slowdown in its most recent forecast. Other commentators despair for Europe’s prospects given Germany’s adamant insistence on austerity programs throughout the eurozone.²⁵

The rates of change in energy intensity measures (energy/GDP ratios, for example) for Europe will very likely decline more slowly than rates in the United States, Canada, and probably Mexico if economic growth stops in Europe. Logic and the data suggest that efficiency improvements in manufacturing capacity occur faster during periods of economic growth as less-energy-intensive capital equipment replaces older equipment. Even though it was once an energy glutton, the United States has benefited and will continue to gain from embracing energy efficiency. These gains will in turn help the country’s economy (as well as those of Mexico and Canada) keep growing.

On a final note, China will almost certainly do better than even the US in this respect. The country started from the highest Btu/GDP level of all. According to EIA, China used 80,000 Btu per dollar of GDP in 1980 (compared to 13,000 for the US and 6,000 for Japan). By 2011, however, it had cut this ratio to 26,000 Btu per GDP dollar, while Japan had reduced its ratio to 4,500.

Decentralized Government: A Boon for Growth

The Tenth Amendment to the US Constitution states that “the powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.” This amendment has historically limited the federal government’s reach. It is important today in the areas of resource development and efforts to cut emissions of carbon dioxide and other gases thought to contribute to global warming.

²⁵ Martin Wolf, “Germany Is a Weight on the World,” *Financial Times*, November 5, 2013.

In the case of the oil and gas development, the federal government cannot ban fracking on private lands as France and Germany have. Thus landowners in North Dakota, Pennsylvania, Montana, Oklahoma, New Mexico, and Texas can exploit the oil and gas reserves on their properties while landowners in New York cannot. The states permitting fracking and resource development have adopted their own specific rules. New York, on the other hand, does not yet allow these activities. Consequently, the so-called “tight” oil and gas reserves continue to be developed in the US, although perhaps not at the rate desired.

The Tenth Amendment also limits the federal government’s ability to act on global warming. While the Environmental Protection Act gives the Environmental Protection Agency the ability to limit emissions of various “harmful” gasses, the EPA’s authority to regulate emissions of carbon dioxide is still not clear.

California offers the best example of the advantage of such independence. More than fifty years ago, the state led the nation in efforts to curb air pollution. Even today, it is exempt from the Clean Air Act because the nation’s law actually followed the state’s example. California today has passed legislation requiring carbon emission reductions and has introduced its own carbon trading system. While many object, the state’s aggressive policy has provided a unique test on a relatively small scale.

The state’s modest size compared to the United States as a whole or Europe has allowed it to adjust quickly when experiments fail. For instance, California’s disastrous experience with electricity deregulation in 2000 triggered numerous changes to a flawed system (and Enron’s bankruptcy). As a consequence, independent generators there now produce increasing amounts of electricity from renewable fuels.

Europe, in contrast, has bound itself to a system that seems to prohibit action. Most EU members, for example, would like to abandon coal. Poland, though, does not and is blocking some actions. The EU

meantime passed regulations to close large coal-fired power plants to comply with rules. A number of these in the United Kingdom will shut down as a result, possibly creating power shortages in the coming winter and the future.

North America: Not at Russia's Mercy

The primary source of Europe's and possibly China's future economic problems is Russia. Russia supplies thirty-five percent of the petroleum consumed in Europe and perhaps thirty percent of the gas consumed. North America, in contrast, receives nothing from Russia. European government and company officials are working aggressively to reduce their dependence on Russia and moderate that country's market power, although with little success.

Many policymakers and executives in Asia are seeking similar solutions. However, Russia has the advantage of available supply and location.

Russia's strategy is clear. Gazprom, the monopoly that today controls Russian natural gas exports, wants to diversify its markets quickly. Russia does not want to accept lower prices. Its actions are also meant to signal buyers that low US gas prices are not sustainable.

In mid-October, Alexander Medvedev, Director-General of Gazprom Export, told Platts that Russian gas prices would be lower than the price for US natural gas shipped on LNG tankers. He also asserted that US gas prices would have to rise: "In the US, the price of gas does not cover the average cost of its production. Sooner or later, the market mechanisms have to balance the price."²⁶

Medvedev explained that Gazprom expected US prices to rise thirty to forty percent within three years. This would bring US prices up to \$6 per million Btu (mmBtu) in his view. He then added that the cost to liquefy and transport US gas to Europe or Asia would boost prices to \$12 or \$13 per mmBtu, or around

²⁶ Brian Scheid, "INTERVIEW: Russian Gas to Remain Competitive Long Term: Gazprom's Medvedev," *Platts Global Alert*, October 14, 2013.

\$400 per thousand cubic meters. Based on these calculations, he considers Russian gas “to be quite competitive.”

Medvedev predicted that European demand would increase 145 billion cubic meters (bcm) by 2025 and 185 bcm by 2035. The 2025 rise represents a thirty-percent increase from Europe’s 2012 consumption of 431 bcm. The 2035 hike would be a cumulative boost of sixty-nine percent. In Medvedev’s view, Russia has the reserves and production capacity to meet the higher demand.

The Gazprom executive then asserted US supplies are less secure. “US exporters will have ‘difficulties ensuring reliability’ due to the extensive distance, while Russian LNG “will be more predictable and safe.”

Medvedev argues world gas buyers must pay more for Russian gas now in order to ensure their gas supplies in the future. His underlying message is that Russia will not cut prices.

Medvedev may have a point. *The Financial Times* reports that the number of new LNG projects that have been funded for construction in 2012 dropped from fourteen million tons per annum in 2011 to nine million tons per annum in 2012. Furthermore, most of the 2011 projects funded were to be built outside of the US, while all the projects funded in 2012 were to be constructed in the US. The lack of funding is attributed to the unwillingness of buyers to sign oil-linked contracts. The consequence could be limited supplies outside the US after 2020.²⁷

Asia’s ability to compete with the US will suffer as well unless natural gas consumers there can force gas sellers to abandon oil-linked pricing. So far, exporters have forestalled this change. European and Asian consumers will eventually make them accept lower LNG prices. The adjustments will take years,

²⁷ Guy Chazan and Ajay Makan, “Discord on LNG’s Price Hits Supply,” *Financial Times*, November 25, 2013.

however. Meanwhile, the high gas prices charged to Asian and European buyers will continue to boost the US economy.

Conclusion

This paper has made the case that the current decade and perhaps the first fifty years of the current century will see the United States and/or the United States, Canada, and perhaps Mexico be the global economy's "locomotive."²⁸ This view is founded on six arguments.

First, the United States enjoys and will continue to enjoy lower energy prices for years, if not decades.

The US has reserves that can be developed to supply the country. Further, the energy industry's structure is uniquely designed to make sure these reserves come to the market.

Second, the US financial system is far sounder than those in other nations. It is also more creative. This means that smaller firms here will continue to have access to financial resources and to use hedging practices that exist nowhere else in the world. The large, deep US financial system will fund even more rapid innovation at home.

Third, the competitiveness of the US and Canadian system, spurred on by abundant and available financial resources, prevents large integrated energy companies from controlling energy markets in these countries. This places the United States in a unique position compared to other nations and regions. In Europe and China, the very large multinational energy companies still dominate, leaving those areas with much higher costs.

Fourth, the United States and Canada benefit from being reformed "energy gluttons." Accelerating conservation and greater reliance on renewables will free increasing volumes of energy for export or use

²⁸ The economic "locomotive" term first appeared more than thirty years ago in reference to Germany's role as the leader of global economic growth.

in new manufacturing plants. Declining consumption will also free up individual and corporate incomes to be spent on other activities.

Fifth, the United States and possibly Canada gain from their governments' structure. Neither country will be subjected to the counterproductive national or region-wide regulation found in Europe, South America, and most of Asia.

Sixth, North American energy users are not under Russia's thumb. That country's determination to maintain high natural gas prices, and in the future oil as well, will condemn much of the world to higher energy costs. The nations tied to Russia may try to reduce their oil and gas use (as Germany has). To date, though, these efforts seem only to have pushed energy prices higher while slowing growth. North America, particularly the United States, seems today to be ideally positioned to grow faster than the rest of the world.

Tables and Figures

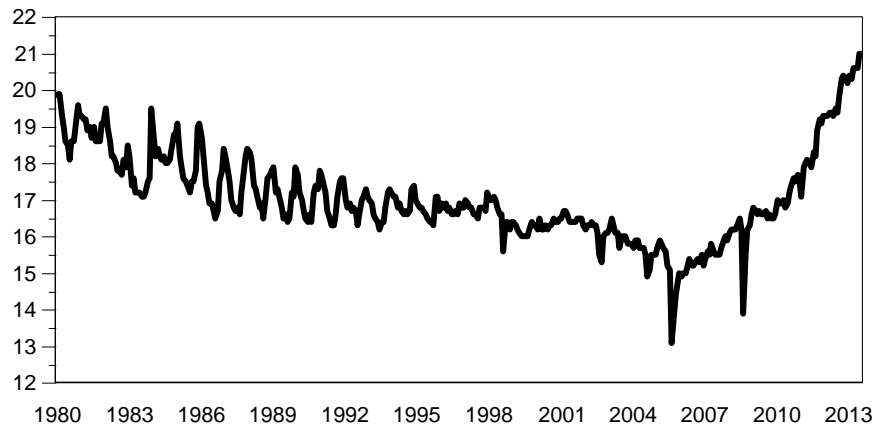
Table 1. Change in Energy Intensity for Three Economies between 1980 and 2011 (Btu per 2005 Dollar of GDP)

	<u>1980</u>	<u>2011</u>	<u>% Change</u>
US	13,381	7,329	(45.2)
Sweden	9,762	5,177	(47.0)
Japan	6,304	4,561	(27.6)

Source: US EIA; PKVerleger LLC.

Figure 1
US Crude Oil and Natural Gas Production,
Monthly Data, January 1980 to August 2013

Million Barrels per Day



Source: US DOE.

Figure 2
History and Forecast for Natural Gas Prices in the US, Germany, and Japan, 1992 to 2018

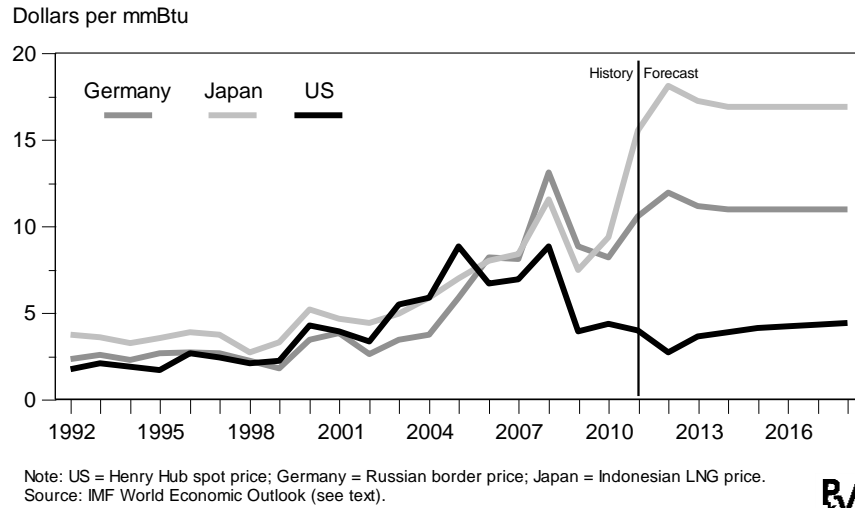


Figure 3
Dated Brent Price vs. Henry Hub Spot Natural Gas Price, Monthly Data, January 2005 to October 2013

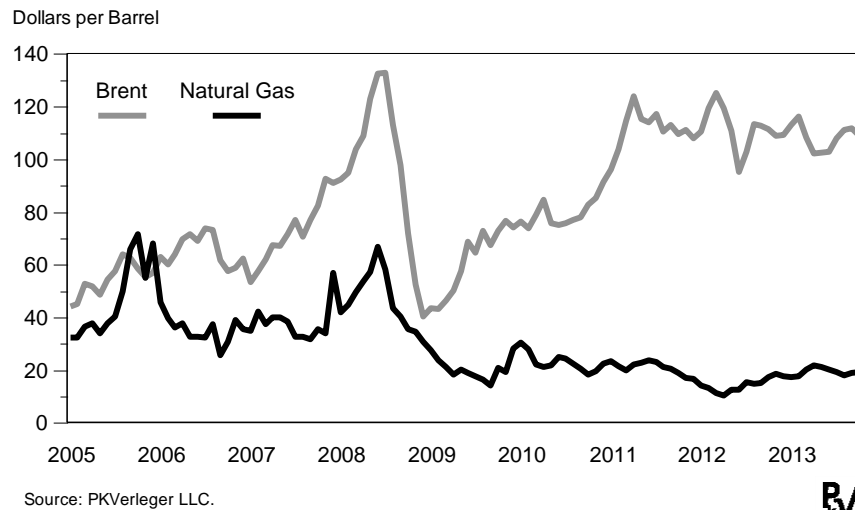


Figure 4
Industrial Production in the US, France, Germany, Italy, and the United Kingdom, 1990 to 2018

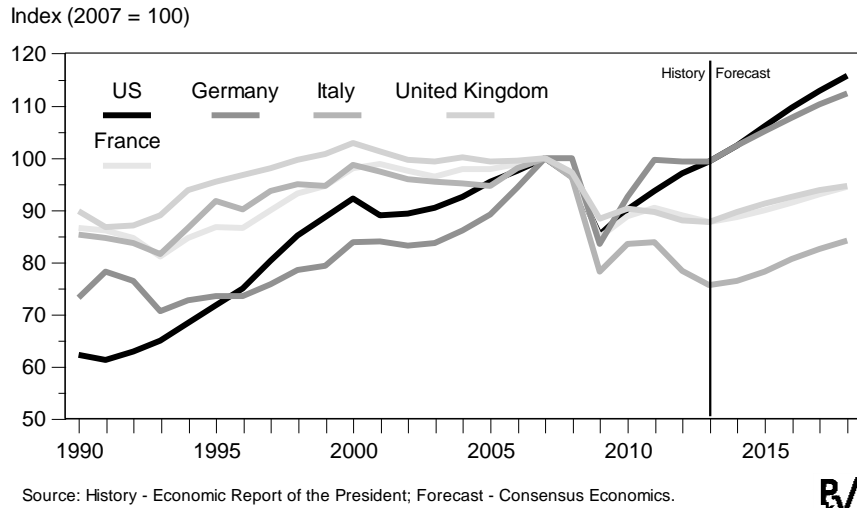


Figure 5
Mid-November 2013 Forward Price Curve for Natural Gas

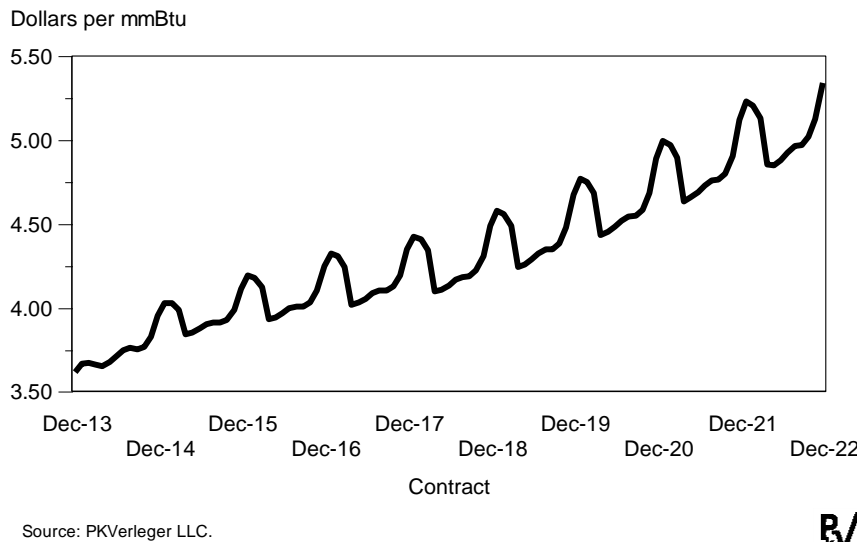
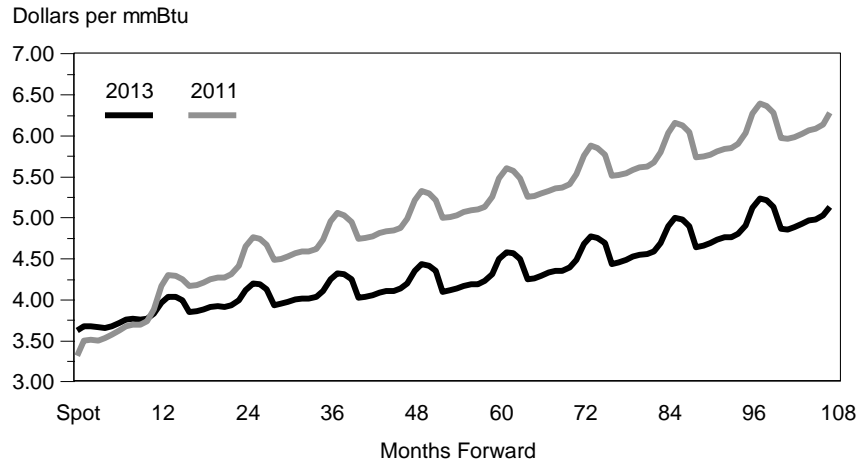


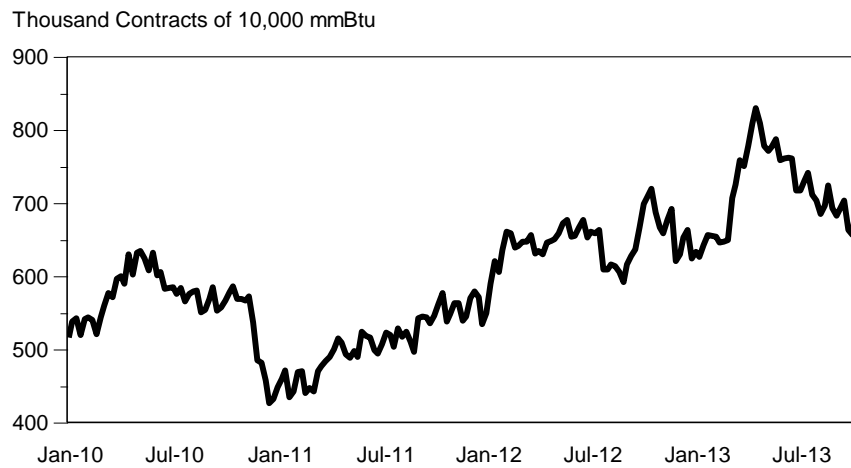
Figure 6
Forward Price Curve for Natural Gas, Mid-November 2013
vs. Mid-November 2011



Source: PKVerleger LLC.



Figure 7
US Natural Gas Production Hedged on CME and ICE
by Producers, January 2010 to October 2013



Source: CFTC



Figure 8
Energy Intensity Index for United States, Japan,
and Germany, 1973 to 2012

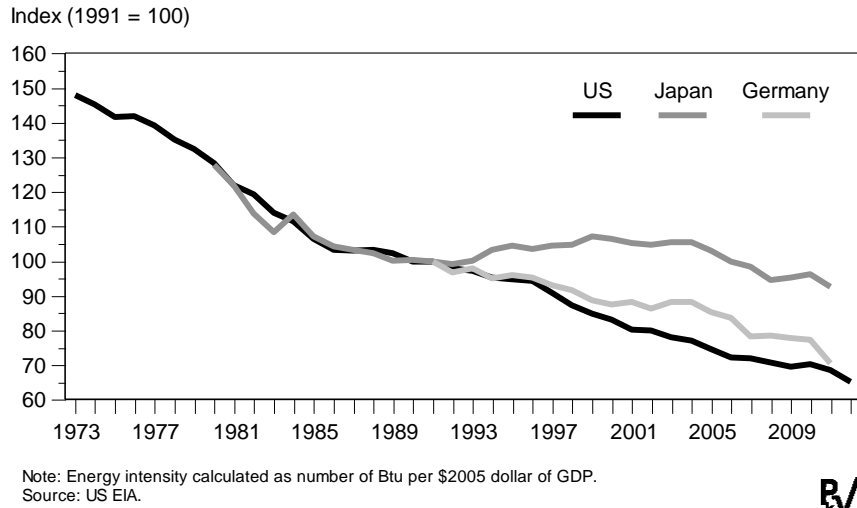


Figure 9
Monthly Constant Dollar US Consumer Expenditures on Gasoline
vs. Expenditures on All Other Goods, 1999 to 2013

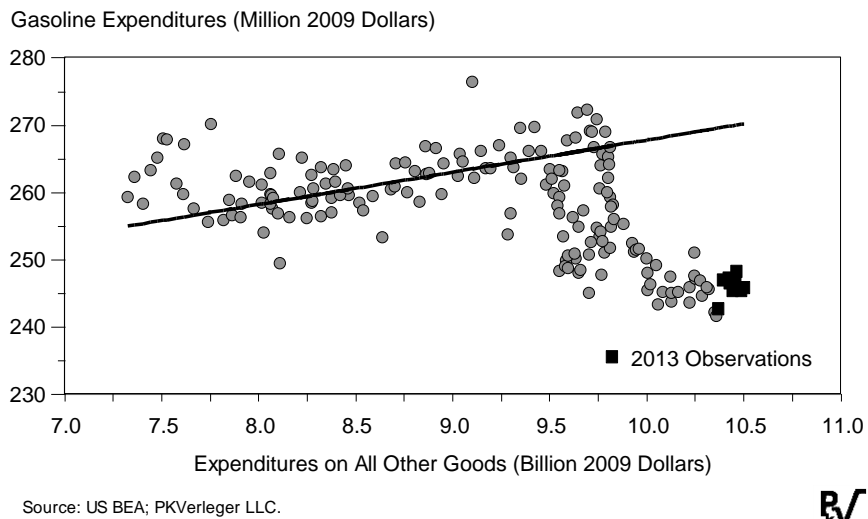


Figure 10
Japan's Lost Decade: Year-to-Year Change in Real GDP, 1975 to 2013

